

I CLAIM:

1. A separation tray suitable for being horizontally mounted in a normally vertical column, which separation tray comprises a normally horizontal upper wall and a normally horizontal lower wall defining an inner space between them; a means for admitting fluid to the inner space; a means for removing liquid from the inner space; a means for removing gas from the inner space; at least one primary separation device within the inner space, for separating fluid into primary gas and liquid-enriched fluid, which primary separation device comprises:

a normally vertical tubular conduit having at its lower end an inlet for fluid, which inlet is in fluid communication with the means for admitting fluid, and having at its upper end an outlet for primary gas, from which outlet an outlet conduit extends to a primary gas outlet opening in the upper wall, which primary gas outlet opening forms part of the means for removing gas;

a swirl-imparting means arranged in the conduit between the inlet for fluid and the outlet for primary gas, so as to cause, during normal operation, the formation of a layer of liquid-enriched fluid in an annular region adjacent the inner surface of the conduit downstream of the swirl-imparting means, which liquid-enriched fluid comprises secondary gas;

and which separation tray further comprises a means for removing and guiding liquid-enriched fluid from the primary separation device to a secondary separation means for removing entrained liquid from secondary gas,

wherein the secondary separation means for removing entrained liquid from secondary gas is formed by the free inner space between the upper and lower walls, which free inner space has in its lower part an outlet for liquid in fluid communication with the means for removing liquid and in its upper part an outlet for secondary gas, which extends to a secondary gas outlet opening in the upper wall, which secondary gas outlet opening is separate from the primary gas outlet opening and forms part of the means for removing gas, and wherein the means for removing and guiding liquid-enriched fluid is arranged to admit all liquid-enriched fluid downwardly into the free inner space.

2. The separation tray according to claim 1, wherein the means for removing and guiding liquid-enriched fluid is arranged to admit all of the liquid-enriched fluid to the free inner space at a position within 50%, preferably within 30%, of the spacing between upper and lower walls, counted from the lower wall.

3. The separation tray according to claim 2, wherein an inlet of the means for removing and guiding liquid is formed by at least one opening in the wall of the tubular conduit of the primary separation device, downstream of the swirl-imparting means, and wherein the means for removing and guiding liquid-enriched fluid comprises a return skirt arranged externally over the upper part of the conduit.

4. The separation tray according to claim 3, wherein the a further inlet of the means for removing and guiding liquid-enriched fluid is formed by an annular opening between the upper end of the tubular conduit and the return skirt.

5. The separation tray according to claim 2, wherein the means for removing and guiding liquid-enriched fluid has an inlet at the upper end of the conduit of the primary separation device, and is arranged to admit the liquid-enriched fluid into the free inner space at a position closer to the lower wall by at least 10% of the length of the conduit, counted from the inlet at the upper end of the conduit.
6. The separation tray according to claim 5, wherein the means for removing and guiding liquid-enriched fluid is formed by a return skirt that is formed integrally with the upper wall.
7. The separation tray according to claim 6, wherein separate outlets for primary and secondary gas are arranged in the upper wall.
8. The separation means according to claim 7 and provided with a return skirt, wherein the return skirt is annularly U-shaped.
9. The separation tray according to claim 8, wherein the swirl-imparting means is formed from a metal plate by providing the metal plate with slits so as to define segments, followed by bending the segments out of the plane of the metal plate.
10. The separation tray according to claim 9, wherein the each segment has the form of a circle sector, and is bent around a radius out of the plane of the metal plate.
11. The separation tray according to claim 10, wherein the slits are provided by means of laser cutting.
12. The separation tray according to claim 11, wherein the swirl imparting means is integrally formed with the bottom wall.

13. The separation tray according to claim 12, wherein a plurality of primary separation devices is arranged on the corners of a regular grid, in particular a grid formed by quadratic cells or equilateral triangular cells.

14. The separation tray according to claim 13, when mounted in a column.